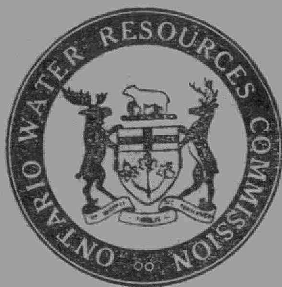


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O. W. R. C.
Industrial
Wastes

THE
ONTARIO WATER RESOURCES
COMMISSION

STATUS OF POLLUTION CONTROL

in the

CANNING INDUSTRY

in the

PROVINCE OF ONTARIO

1967 to 1968



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THE STATUS OF POLLUTION CONTROL IN THE
CANNING INDUSTRY IN THE PROVINCE
OF ONTARIO
1967 TO 1968

DIVISION OF INDUSTRIAL WASTES
ONTARIO WATER RESOURCES COMMISSION

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This presentation is essentially a status report attempting to outline the waste disposal procedures employed by the canning industry in the Province of Ontario. The various methods practiced by the industry are discussed separately and then the industries using these methods are tabulated following each discussion.

Those canneries that discharge wastes with an unsatisfactory quality to natural bodies of water are discussed in a separate section of this report with the flow rates and waste loadings included in each summary. An attempt has been made to point out the magnitude of the pollution load discharged from these industries by summing all the flow rates and waste loadings.

The discussions in this report are centered around the canning industry in general, pointing out the need for treatment and some of the problems encountered in designing appropriate treatment works. Attempts are also made to relate the plant production with the waste loadings that may be expected for each product processed.

In general, it was concluded that the canning industry had faced up to the problem of waste disposal in a satisfactory manner. With respect to the remaining establishments having inadequate waste treatment facilities, it was recommended that the OWRC take a strong stand to insure that the wastes are dealt with in a satisfactory manner in accordance with the OWRC objectives.

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SUMMARY

There are ninety-one active canneries in the Province of Ontario. Of this total, seventy-one may be considered as having suitable means of waste disposal while the remainder discharge wastes to natural watercourses that are unacceptable in terms of the OWRC objectives.

The total volume of unacceptable wastes discharged to watercourses from the canning industry has been estimated at 11 million gallons per day representing a waste loading of 31 tons of BOD₅ and 17 tons of suspended solids per day. In terms of population equivalents the BOD₅ figure, for example, represents the waste discharge from 310,000 people comparable to a city the size of Hamilton having no sanitary waste treatment facilities.

In general, it may be viewed that the canning industry in the Province of Ontario has made significant attempts to prevent the pollution of natural waters by its process waste discharges. There are, however, a number of canneries that have minimum treatment and, in these cases, it is recommended that the OWRC take prompt action to insure that proper waste control and/or treatment is provided to bring the wastes in line with the OWRC objectives for discharge to natural watercourses.

PLANT PROCESSES AS RELATED TO THE PRODUCTION OF
INDUSTRIAL WASTES

Generally, the harvest arrives by truck directly from the farms for immediate processing as prolonged storage may deteriorate the quality of the final product. From the unloading platforms conveyors are used to carry the produce into the plant. If the fruit or vegetable is of a fragile nature, it is normally dumped into a water flume to soften the fall and to prevent bruising. This water is usually recirculated and sewered only when it becomes too dirty at the end of the day.

Once inside the plant the produce receives a primary wash which may be in the form of a spray rinse or immersion into a running water tank to remove the mud and grit. Wastes from this operation are normally low in BOD₅ and high in suspended solids. This is especially the case when underground vegetables are processed such as potatoes, carrots, or beets.

After the primary wash the produce goes through a number of preparatory stages to bring it to a final state suitable for canning. A number of process wastes are produced during these stages. The nature of these wastes varies widely depending on the product and the number of stages required.

Peas and beans require little processing other than washing and classifying. A brisk spray is usually sufficient to wash the produce to remove the loose dirt and cuttings, before centrifuging to grade the product. Large quantities of water are used as a carrying medium to transport peas from one stage to another. In general, when peas and wax beans are processed high volumes of wastes are produced that are relatively low in BOD₅ and suspended solids.

Fruits that have pits and cores have to be opened to remove the inedible material. Prior to this, peaches and pears are passed through a solu-

tion to remove the peel and then through a water spray to wash off the adhering chemicals. Cherries, on the other hand, are passed immediately through a rotating drum where the pits are removed automatically. Whenever a product is broken during its preparation, there is an inevitable loss of material to the process water resulting in an eventual discharge of strong wastes having high concentrations of BOD₅ and suspended solids.

In Ontario, tomatoes are usually processed into juice or into a whole canned commodity. In the production of juice, the tomatoes are passed through slashers and extruders to separate the solids from the liquid. The pulp is wasted while the juice is blended, pasteurized, and canned. Whole tomatoes are prepared on long tables where the core and peel are removed manually. Cans containing the whole tomatoes are topped up with juice and sealed. Wastes from the tomato processing industry are discoloured and high in BOD₅ and suspended solids.

The processing of pumpkins and corn produces the strongest waste discharged from the canning industry. In both cases the product is broken and, as there is a prolonged contact of vegetable with the process water, there is a substantial transfer of material to the process water. Dewatering of corn after flotation washing results in the discharge of a very strong waste. The cooking of pumpkins prior to pulping produces an effluent that is extremely potent. Although the processing of the above two vegetables does not produce large volumes of wastes, they are extremely strong having high concentrations of suspended solids and BOD₅.

After the cans have been sealed, the contents are cooked in pressure cookers and then cooled to lower the temperature for easier handling. In some cases the cooling water is recirculated or reused in other plant operations,

however, in most instances it is sewered after a single run. This waste is normally uncontaminated and suitable for discharge to a natural watercourse.

As canneries produce foods for human consumption, all operations must be clean. The machinery, floors, and utensils are therefore washed at the end of each processing day. This cleanup operation requires copious amounts of water and lasts anywhere from three to six hours. During this period, wastes of variable strengths are discharged, being extremely potent at the start and tapering off towards the end of the cleanup period. This effluent contains not only the normal organic canning wastes, but also alkaline cleaning solutions.

METHODS USED IN THE DISPOSAL OF LIQUID WASTES FROM THE CANNING

INDUSTRY IN ONTARIO

Process wastes from the canning industry are organic in nature and generally contain high concentrations of BOD₅ and suspended solids. If discharged indiscriminately, they can upset the natural balance of a watercourse and become a serious source of pollution. The canning industry in general is actively engaged in waste control and/or treatment programmes and for the most part the process wastes are dealt with in a satisfactory manner.

Cannery wastes are basically of a similar nature and consequently the treatment schemes are limited, normally consisting of land disposal, discharge to municipal systems, lagooning, and biological treatment. All these methods are used throughout the Province and are discussed under separate headings.

Land Disposal

The two most prevalent methods of land disposal are spray irrigation and the straight haulage and spreading of wastes on land. Both procedures are used extensively throughout the Province of Ontario and, as they vary considerably, are discussed separately.

1) Spray Irrigation

Disposal of cannery wastes by spray irrigation is an adaptation from the artificial watering of crops by a portable sprinkling system. There are a number of good reasons why this system is attractive which include low costs of operation, elimination of odour problems, and possible irrigation of edible crops. There are, however, a number of important design criteria that have to be met in order that this system can become completely effective.

The wastes require proper screening prior to spray irrigation to prevent the blockage of the spray nozzles. Depending upon the size of the spray nozzles, fine screening of the wastes is normally sufficient to have trouble free operations. A reservoir must also be provided to store the wastes prior

to pumping. This reservoir must be large enough to maintain continuous pumping and yet small enough to prevent the wastes from becoming septic.

The land is the single most important criteria. The soil characteristics and cover crop dictate the rate of application and the number of acres required to handle the wastes from a particular cannery. The soil characteristics vary from excellent for a soil that is sandy loam to poor where the soil is predominantly clay. A good cover crop is very essential to increase the rate of absorption, evaporation, and transpiration, and to prevent the classification of soil as well as erosion. With a relatively good system, it is possible to spray anywhere from three to four inches of wastes per acre per day with application rates not exceeding 0.4 to 0.6 inches per acre per hour. An area sprayed at this rate may be resprayed after about six days.

This system may be very easily upset if the optimum rate of application is exceeded. If the nozzles are not relocated and land is over-sprayed or saturated with rain, pools of wastes may build up. The obnoxious odours resulting from the organic decomposition may become a public nuisance. Also if the land is sloped, over application may produce a heavy runoff with the drainage flowing into a watercourse. All these problems may be overcome by the acquisition of more land to increase the spraying area and reduce the volume of wastes applied per acre.

Spray irrigation is most convenient for the smaller to medium canneries located in rural areas and having waste volumes ranging from 10,000 gallons per day up to as high as 150,000 gallons per day. With a good cover crop and a porous soil a waste discharge of 150,000 gallons per day may be handled safely on a 175-acre plot of land.

Once the waste volume approaches 200,000 to 300,000 gallons per day, the cost of land becomes the critical and over-riding factor. To treat 300,000

gallons per day of waste would require a parcel of land in the neighbourhood of 350 acres. If the cannery is located in a prime agricultural area, land costs may range in the order of \$1,000.00 per acre. As well as being costly, a system of this nature would be very awkward to operate. When higher waste volumes are encountered, it would likely be more practical to consider an alternate means of treatment.

2) Waste Haulage and Spreading on Land

There are a number of canneries in the Province, fourteen in total, that dispose of their process wastes by spreading them on land. These canneries are relatively small and for the most part have waste discharges less than 10,000 gallons per day. Because smaller plants in general have a relatively short operating season, very few problems are encountered with this means of disposal.

Normally, the process wastes are stored and then transported onto the fields in a tank truck. Spreaders are used to apply the wastes on land uniformly to prevent the formation of pools. If sufficient land is available this is an excellent means of disposal as it provides complete treatment without any discharge to a watercourse.

The only danger in this method of disposal is over application. Long standing pools may turn septic from organic decomposition and emit obnoxious odours. Also the fields may turn muddy in spots and become impassible to vehicles preventing further application. For a more efficient use of land, the ground should be ploughed before and after the wastes have been applied. This would tend to break up the soil making it more porous and increase the rate of infiltration. If this is not an immediate solution to the problem, additional land would have to be acquired.

TABLE NO. I

A SUMMARY OF THE CANNING INDUSTRIES TREATING
PROCESS WASTES BY SPRAY IRRIGATION

NAME	LOCATION	WASTE VOLUME (lgpd MAX.)	SPRAY AREA (ACRES)	REMARKS
Green Giant of Canada Ltd.	Harrow	500,000	200	Satisfactory.
Green Giant of Canada Ltd.	Tecumseh	325,000	160	At times there is an overflow to Manning Drain.
Canadian Cannery Limited	Kingsville	100,000	10	Satisfactory.
Canadian Cannery Limited	Exeter	275,000	50	Considerable runoff to Ausable River.
Canadian Cannery Limited	Dresden	900,000	60	Under-drainage from 20 acres to Sydenham River.
Imperial Food Products Ltd.	Twp. of Gosfield South	60,000	N/A	Satisfactory. Retention pond holds excess wastes over winter that per- colate into ground.
Lakeside Packing Co. Ltd.	Twp. of Colchester South	40,000	10	Satisfactory. Use lagoon to store wastes.
Biggar Frosted Foods Ltd.	Twp. of Clinton	N/A	N/A	Satisfactory. Use lagoon to store wastes.
Canadian Cannery Limited	St. Davids	180,000	90	Satisfactory. Runoff treated in lagoon.

Table No. I Continued

NAME	LOCATION	WASTE VOLUME (Igcd MAX.)	SPRAY AREA (ACRES)	REMARKS
Guelph Reformatory	Guelph	N/A	N/A	Satisfactory.
Baxter Canning Company Limited	Bloomfield	100,000	10	Satisfactory.
United Cannery	Wellington	94,000	350	Satisfactory.
Produce Supply Service Company Limited	Township of Westminister	100,000	20	Satisfactory. Lagoon used in conjunction with spray system.
Vineland Canning Company Ltd.	Font Hill	N/A	15	Unsatisfactory.
Galipeau J. E. and Sons.	Township of Anderson	12,000	20	Wastes stored in lagoon and spray irrigated in spring. Satisfactory.
York Farms Limited	Brantford	400,000	24	Serious odours and fly problems en- countered.
United Cannery	Consecon	90,000	40	Satisfactory.

TABLE NO. II

SUMMARY OF CANNING INDUSTRIES

HAULING AND SPREADING WASTES ON LAND AS A MEANS OF DISPOSAL

NAME	LOCATION	WASTE VOLUME (Igcd Max.)	REMARKS
La Chance Brothers	Twp. of Sandwich East	6,000	Satisfactory. Wastes discharged to shallow furrows.
Antaya J. and Sons	Twp. of Sandwich South	4,000	Satisfactory. Wastes discharged to land depression where they percolate into soil.
Wright Canning Company	Twp. of Colchester Nth.	3,000	Satisfactory. Wastes hauled on land.
Sun Parlor Canning Co.	Twp. of Rochester	3,000	Wastes hauled on land.
King Canning Company	Twp. of Dover	3,000	Wastes hauled on land. Satisfactory.
Glazier Canning Company	Blenheim	10,000	Wastes hauled on land. Satisfactory.
Crofton Canning Co. Ltd.	Twp. of Sophiasburg	4,000	Wastes discharged to gully.
Greer Canning Co. Ltd.	Wellington	5,000	Satisfactory. No effluent.
Cherry Valley Cannery	Twp. of Athol	3,500	Wash water discharged to marsh. Unsatisfactory.

Table No. II (Cont'd)

NAME	LOCATION	WASTE VOLUME (Igcd Max.)	REMARKS
Par-O-Dice Fruit Farm	Hallowell Township	2,700	Land disposal. Satisfactory.
Pleasant Valley Cannery Ltd.	Hillier	600	Use of land disposal and lagoon. Satisfactory.
K. G. Konley and Sons	Hallowell Township	6,000	Wastes land disposed. No overflow. Satisfactory.
J. P. Sprague and Son	Ameliasburg Township	15,000	Wastes to farmland. Satisfactory.

Discharge of Cannery Wastes to a Municipal Sanitary Sewerage System

A considerable number of canneries throughout the Province discharge process wastes to a sanitary sewer for eventual treatment at a municipal water pollution control plant. In a broad sense, because of their organic nature, cannery wastes have always been considered as being amenable to treatment and for this reason this practice has been considered as an excellent means of disposal. This practice, however, does have serious drawbacks as indiscriminate seasonal discharges of cannery wastes to a sanitary sewer may cause serious operational problems at the sewage treatment plants.

In general, municipal waste treatment systems fall into the three main categories of primary treatment, activated sludge and lagoons. Each of these systems reacts differently to cannery wastes and consequently each system is discussed under a separate heading.

1) Discharge of Cannery Wastes to a Primary Water Pollution Control Plant

Primary treatment plants work on a very simple principle where part of the BOD_5 and suspended solids is removed from the wastes by simple sedimentation. The wastes remain in a retention tank under quiescent conditions during which time the entrained solid material that is allowed to settle out is removed from the bottom as a sludge. The relatively solid-free supernatant is discharged as the treated effluent.

In general, cannery wastes receive minimum treatment in a primary water pollution control plant. Most of the entrained solids are of a fibrous nature and consequently they are not readily settled. A major portion of the BOD_5 is in a soluble form and certainly very little of this is removed by simple sedimentation. If unscreened cannery wastes are discharged to a primary water pollution control plant, only about 50% of the suspended material is removed during treat-

ment. If proper screening is carried out at the cannery, the above figure may drop to about 30%.

Unless the cannery is within a municipality or a built up residential area, it may be more practical to provide primary treatment facilities at the industry. This would remove a considerable hydraulic loading from the municipal plant resulting in the better treatment of the sanitary wastes. As primary treatment facilities are neither complicated nor difficult to operate, they should be easily afforded by most canneries. If the municipal primary plant is later to be expanded to include secondary treatment, the treatment facilities at the industry could provide excellent pretreatment and good equilization of wastes to permit the discharge of the process wastes to the sanitary sewer.

2) Discharge of Cannery Wastes to an Activated Sludge Treatment Plant

Cannery wastes can exert extreme shock loads on municipal plants employing an activated sludge process, enough to upset the operations entirely. Until proper operations are restored, treatment efficiencies may drop to 25% resulting in an effluent of extremely poor quality being discharged to a natural watercourse.

It is extremely difficult to acclimatize an activated sludge plant to cannery wastes because the waste volume and quality varies considerably from day to day, as well as from pack to pack. Waste characteristics vary considerably with the product being canned. When peas and beans are processed, high volumes of wastes are discharged having relatively low concentrations of BOD₅ and suspended solids. On the other hand, if corn or pumpkins are processed waste volumes may drop by one-half and the component concentrations may increase by a factor of ten. The industry should, therefore, provide pretreatment of wastes in the form of screening and equalization prior to discharge to the sanitary sewer.

Assuming proper pretreatment, the cannery wastes may still be nutrient deficient and may retard the growth or build up of sludge at the WPCP. In these cases, nutrients would have to be added in the form of nitrogen and/or phosphorus at the treatment plant when the canneries are in operation and cannery wastes are being treated.

3) Discharge of Cannery Wastes to a Municipal Lagoon

Although lagoons tend to absorb shock loads better than activated sludge plants, they are still susceptible to the high waste loadings associated with cannery wastes. The treatment efficiencies may drop considerably during the canning season if the waste loadings discharged to the lagoon exceed the design criteria. If insufficient oxygen is available, the heavily overloaded portions of the lagoon may turn septic. This would result in the emission of obnoxious odours especially in spring during the ice break-up.

To overcome the septic conditions, additional oxygen may be provided artificially. The aeration facilities could be installed and operated only during the canning season to handle the surplus waste load. During the remainder of the year the lagoons may have sufficient capacity to treat the sanitary wastes without aeration.

The capacity of the lagoon may be increased by providing additional cells to handle the waste loading from the cannery. In cases where the waste loading from the cannery greatly exceeds the waste loading from the municipality, then this type of expansion may be impractical. Unless there is a suitable cost sharing agreement between the industry and municipality, the cannery should consider a private form of treatment.

TABLE NO. III

A SUMMARY OF THE CANNING INDUSTRIES DISCHARGING PROCESS WASTES
TO THE MUNICIPAL POLLUTION CONTROL PLANTS

NAME	LOCATION	MAX. PROCESS WASTE VOLUME (lcpd)	BOD ₅ (lbs/day) (MAXIMUM)	WASTE LOADING SUSP. SOLIDS (lbs/day) MAX.	TYPE OF MUNICIPAL TREATMENT	OPERATION OF MUNICIPAL PLANT	PRETREATMENT AT INDUSTRY
Canadian Canners Ltd.	Amherstburg	420,000	N/A	N/A	Primary Treatment	N/A	Screening and Settling
Canadian Canners Ltd.	Leamington	60,000	1,000	800	Primary Treatment	Poor Over- loaded	Vibrating Screens
Canadian Canners Ltd.	Simcoe	70,000	N/A	N/A	Activated Sludge	Satis- factory	Screening
Canadian Canners Ltd.	Waterford	40,000	500	300	Lagoon	Over- loaded	Hand Cleaned Screen
Stokely Van- Camp of Canada Limited	Essex	750,000	N/A	N/A	Lagoon	Over- loaded	Screening
Stokely Van- Camp of Canada Limited	Whitby	300,000	2,200	1,300	Activated Sludge and Trickling Filter	Over- loaded	Vibrating Screens
St. Williams Preserves Ltd.	Simcoe	N/A	N/A	N/A	Activated Sludge	Satis- factory	None
St. Williams Frozen Fruits Limited	Simcoe	100,000	N/A	N/A	Activated Sludge	Satis- factory	None

Table No. III Continued

NAME	LOCATION	MAX. PROCESS WASTE VOLUME (lgpd)	BOD ₅ (lbs/day) MAXIMUM	WASTE LOADING SUSP. SOLIDS (lbs/day)MAX.	TYPE OF MUNICIPAL TREATMENT	OPERATION OF MUNICIPAL PLANT	PRETREATMENT AT INDUSTRY
Culverhouse Canning Co. Limited	Port Dover	5,000	1,000	300	Primary Treatment	Satisfactory	Screening
Bright Canning Ltd.	Niagara Falls	INFORMATION NOT AVAILABLE			Primary Plant	Good	Unknown
Canadian Home Products Ltd.	Niagara Falls	60,000	N/A	N/A	Primary Plant	Good	Grease Control
Gerber Products of Canada Ltd.	Niagara Falls	200,000	N/A	N/A	Primary Plant	Good	Screening followed by settling
Lincoln Canning Co. Limited	St. Catharines	38,000	400	140	Primary Plant	Good	None
Mathew Wells Company Ltd.	Guelph	INFORMATION NOT AVAILABLE			Activated Sludge	Good	None
Niagara Food Products Ltd.	Hamilton	INFORMATION NOT AVAILABLE			Primary Plant	Good	None
Nicholson and Stetler Ltd.	Waterdown	INFORMATION NOT AVAILABLE			Activated Sludge	Good	
Powell Foods Limited	St. Catharines	270,000	2,600	300	Primary Plant	Good	None
W. G. Seals Limited	Richmond Hill	24,000	140	170	Activated Sludge	Odorous	Screen
Reeves and Leavens Can- ning Co. Ltd.	Bolton	20,000	24	16	Activated Sludge	Good	Screen (Basket)

Table No. III Continued

NAME	LOCATION	MAX. PROCESS	WASTE LOADING		TYPE OF MUNICIPAL TREATMENT	OPERATION OF MUNICIPAL PLANT	PRETREATMENT AT INDUSTRY
		WASTES VOLUME (Tgpd)	BOD ₅ (lbs/day) (MAXIMUM)	SUSP. SOLIDS (lbs/day) MAX			
Campbell Soup Company Limited	New Toronto	2,200,000	550	500	Activated Sludge	Good	Rotary Screens followed by Settling and Grease Skimming.
York Farms Ltd.	Brantford	400,000	INFORMATION NOT AVAILABLE		Activated Sludge	Good	Screening
Standard Brand Ltd.	Guelph	PLANT CLOSED ON JANUARY, 1968.					
Libby McNeill and Libby Co. of Canada Ltd.	Chatham	2,000,000	5,000	1,000	Aerated Lagoons	Good	Screening
Trenton Cold Storage	Trenton	33,000	970	200	Primary Plant	Hydraulically Over-loaded	Screening
Brighton Omar	Brighton	30,000	390	170	Lagoon	Good	Screening
Campbell Soup Company Limited	Chatham	1,000,000	1,950	950	Aerated Lagoon	Good	Screening

Total Retention Lagoons

There are a number of canneries in the Province that use lagoons as total retention basins storing all the wastes produced throughout the operating season over the winter months. In spring the contents of the lagoon are emptied to a watercourse at a controlled rate to take into account the dilution provided by the spring runoff. On occasions the wastes are spray irrigated in early spring or summer to empty the lagoon and prepare it for the next operating season.

In winter when there is an ice cover, the wastes are treated by anaerobic decomposition, while in spring and late fall treatment is provided predominantly by aerobic decomposition. In both cases solids are removed by simple sedimentation. From the limited number of samples taken, primary indications are that the wastes meet the OWRC objectives for discharge to a natural watercourse in spring and normally have BOD₅ and suspended solids concentrations below 15 parts per million.

As very little literature data are available on this means of disposal, it cannot be determined whether it is better to discharge the wastes in spring to take advantage of the spring runoff or subject the wastes to aerobic decomposition by holding them through spring until the start up of the canning season. If good BOD₅ reduction occurs during this time, it may be better to hold the wastes longer.

This fill and draw system is a satisfactory means of waste disposal providing the cannery is not located in a highly populated area. Because of the anaerobic decomposition that occurs during the winter, these lagoons usually are sources of odours during the spring break-up. Even though this condition normally lasts for a few days, it may become a serious public nuisance.

To overcome odour problems, masking agents may be used during the ice break-up or the lagoon may be aerated throughout the winter to keep the septic conditions down to a minimum. One dairy in the Province has employed a 5 HP aerator positioned over the lagoon inlet pipe to provide sufficient oxygen and maintain the pond in an aerobic state for the duration of the entire winter. From the limited number of samples taken, and from the limited information available, it appears that this system has worked satisfactorily without producing odours in the spring. Initial findings are encouraging and it is likely that a similar system could be used with holding ponds storing cannery wastes,

TABLE NO. IV

SUMMARY OF CANNING INDUSTRIES USING LAGOONSTO TREAT PROCESS WASTES

NAME	LOCATION	WASTE VOLUME (Igcd Max.)	REMARKS
Essex County Cannery	Twp. of Colchester South	10,000	Total retention of wastes provided. Satisfactory.
Canadian Cannery Ltd.	Ridgetown	90,000	Excess wastes spray irrigated. Lagoon acts as total retention basin on a fill and draw basis.
Erie Canning Co. Ltd.	Twp. of Raleigh	10,000	Wastes are under-drained to Lake Erie. Unsatisfactory. Some spray irrigation also carried out.
Merit Food Products Ltd.	Twp. of Gosfield North	10,000	Stored wastes sprayed on land. Satisfactory.
Sunburst Canning Company	Twp. of Gosfield North	20,000	Satisfactory. Lagoon used on fill and draw basis.
Thomas Canning (Maidstone) Limited	Twp. of Maidstone	8,000	Storage ditch used on fill and draw basis.
Borland Canning Company	Twp. of Mersea	6,000	No effluent from lagoon. Satisfactory.
Southland Canning Company	Twp. of Mersea	18,000	Lagoon is aerated for odour control. Wastes released to Lake Erie during spring floods.
Stoney Point Canning Co.	Twp. of Tilbury North	6,000	Satisfactory. Wastes also sprayed on land.
Countryside Cannery Co. Ltd.	Twp. of Tilbury North	16,000	Satisfactory. Wastes sprayed on land if required.
Ruthven Canning Company	Twp. of Gosfield South	12,000	Satisfactory. Wastes percolate into soil during storage.

Massachusetts Cannery

Massachusetts Cannery Ltd.

Massachusetts Cannery Ltd.

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Massachusetts Cannery Ltd.

Massachusetts Cannery Ltd.

Massachusetts Cannery Ltd.

Massachusetts Cannery Ltd.

Massachusetts Cannery Ltd.

Massachusetts Cannery Ltd.

Massachusetts Cannery Ltd.

Table No. IV Continued

NAME	LOCATION	WASTE VOLUME (lgpd Max.)	REMARKS
Innes Foods Limited	Port Rowan	25,000	Satisfactory. Lagoon used on fill and draw principle.
Niagara Food Products Ltd.	Wheatley	60,000	Lagoon used on fill and draw principle
Arkell Foods Limited	Grimsby	30,000	Lagoon used on fill and draw principle. May discharge wastes to S.T.P.
Tregunno Canning Co. Ltd.	Twp. of Pelham	90,000	Five lagoons acting as total retention basins. Satisfactory.
Shannonville Cannery	Twp. of Tyendinaga	25,000	Loading approximately 36 pounds BOD ₅ per day.
Edge Waters Cannery	Twp. of Sophiasburg	23,000	Unsatisfactory.
Hyatt Canning Co. Ltd.	Twp. of Athol	73,000	Unsatisfactory.
East Lake Cannery	Twp. of Athol	37,000	Waste overflow to marsh.
Bowes Company Limited	Colborne	72,000	Lagoon operated on fill and draw basis.
McKenzie Cannery Limited	Colborne	34,000	Lagoon operated on fill and draw basis.

Treatment by Mechanically Aerated Biological Oxidation Systems

There are only four canneries in the Province that employ artificially aerated forms of biological treatment. Two of the canneries in question operate an activated sludge plant, one operates an oxidation ditch, while the last an aerated lagoon. In two of these cases, although the treatment efficiencies have been in the 85 percent range, the final effluents still exceed the OWRC objectives for discharge to a natural watercourse with respect to the BOD₅ and suspended solids concentrations and, because of the large volume of waste discharged, the waste loading is still appreciable. It should be noted, however, that each of these systems is rather complex and required the expenditure of considerable sums of money to cover installation and operating costs. Therefore, before requesting further treatment to polish the wastes, assimilation studies on the receiving waters should be carried out to determine whether the watercourse is being adversely affected by this waste discharge. Further recommendations should be made based on the results of the study and effluent quality objectives based on the assimilative capacity of the receiving waters.

TABLE NO. V

SUMMARY OF CANNING INDUSTRIES EMPLOYING A MECHANICALLY AERATED BIOLOGICAL
OXIDATION SYSTEM FOR THE TREATMENT OF PROCESS WASTES

NAME	LOCATION	WASTE VOLUME (Igcd MAX.)	TREATMENT	REMARKS
Belle River Canning Co. Ltd.	Belle River	80,000	Activated Sludge	90% BOD ₅ removal. Ef- fluent unsatisfactory for discharge to natural watercourse. Likely to dis- charge wastes to S.T.P.
Hunt Wesson Foods of Canada Ltd.	Tilbury	240,000	Oxidation Ditch	Satisfactory. BOD ₅ re- duction of 95%.
Burtch Industrial Farms	Township of Brantford	No Information Available	Activated Sludge	Satisfactory.
E. D. Smith Company Ltd.	Township of Saltfleet	125,000	Aerated Lagoon	85% reduction in BOD ₅ . Effluent unsatisfactory for discharge to natural watercourse.

PROBLEM INDUSTRIES

There are seventeen industries in the Province of Ontario that may be considered as being perennial problems and a serious source of water pollution. In most cases, except for screening or coarse solid removal no treatment is provided and contaminating wastes are discharged to natural bodies of water. During the peak of their operating season these canneries collectively discharge approximately 11 million gallons of process wastes per day representing a total daily waste loading of 31 tons of BOD₅ and 17 tons of suspended solids. Based on population equivalents, the above BOD₅ figure represents a pollution load similar to 310,000 people or of a city the size of Hamilton having no sanitary waste treatment facilities.

These problem industries are discussed separately in this section of the report. It should be noted that there are other canneries in the Province that contribute to the pollution of watercourses, however, in those cases a solution to the problem is either imminent, or pollution results from accidental breakdowns or spills. The adverse effects on a watercourse are not serious and certainly the waste loadings are not of the same order of magnitude as those listed in this section.

H. J. HEINZ COMPANY OF CANADA LIMITED - LEAMINGTON

H. J. Heinz Company of Canada Limited, located in the Town of Leamington, employs approximately 1,500 people during the peak operating season and is engaged in the processing of a variety of products such as peaches, tomatoes and pickles. The plant pumps 6,000,000 gallons of water per day from the P.U.C. for use in the entire plant operations. Industrial process wastes are discharged to Lake Erie and amount to some 3,000,000 gallons per day. Cooling water is segregated and discharged to the Selkirk municipal drain and thence to Lake Erie.

All the process wastes, including pulp from the juicers and coarse cuttings are sewered and directed to a battery of twelve screens built on the site of the Leamington water pollution control plant and are discharged to Lake Erie through the plant's extended outfall. Some process wastes are also discharged along with the cooling water which at times was noted to contain BOD₅ and suspended solids in concentrations of 180 parts per million and 66 parts per million respectively.

Although the screens are effective in removing the coarse solids, the filtrate discharged to Lake Erie still contains high concentrations of BOD₅ and suspended solids. The waste loadings discharged from this plant were estimated to be in the neighbourhood of 17,500 pounds of BOD₅ per day and 8,600 pounds of suspended solids per day. Of all similar plants in the Province of Ontario this represents the highest waste loading discharged from a cannery.

The Company has been requested to institute a positive waste control and/or treatment programme aimed at producing an effluent suitable for discharge to Lake Erie. The screens and extended outfall are acceptable interim measures until adequate treatment facilities are put into operation, however, they are

by no means considered as the ultimate and final solution to the waste disposal problem.

The Company has submitted a letter to the OWRC indicating that a consulting engineer had been retained and has outlined a programme for the measuring and sampling of the effluent to identify the waste problem and obtain the necessary design data. Although the proposal has been agreed to in principle the Company was requested to provide additional information as well as the consultant's report. The Company was further advised, that as sufficient information was now available on the treatment of this particular type of waste, work on preliminary designs for the new treatment facilities should be carried out concurrently with the sampling programme. Similarly, consideration should also be given at this time to the acquisition of land, methods of financing, etc.

LIBBY MCNEILL AND LIBBY OF CANADA LIMITED - WALLACEBURG

The Libby McNeill and Libby of Canada Limited plant at Wallaceburg processes a variety of products such as green peas, red beets, corn, pumpkins, and lima beans, with the main operations extending from June through to October. Cooling water is segregated and discharged to the Sydenham River via a submerged outfall while the process waste is first screened and then discharged to the same watercourse.

Approximately one-half million gallons of process wastes are directed to the watercourse per day with waste loadings approaching 11,400 pounds of BOD₅ per day and 2,700 pounds of suspended solids per day. The Company has indicated on a number of occasions that it was carrying out studies to design an appropriate treatment system. The industry has retained the services of a consulting engineer to design adequate waste treatment works in the form of spray irrigation. Construction of these facilities is to commence in 1969.

ESSEX COUNTY CANNERS LIMITED

Essex County Cannery Limited operates two separate plants in the Province. The plant in the Township of Colchester South has an adequate means of waste disposal while the operations at the plant in Gosfield North have been a serious source of pollution for some time.

The plant in Gosfield North processes potatoes and tomatoes. All wastes, process and cooling water, are directed to an area at the rear of the plant and are allowed to flow by gravity to a private drain which discharges to an upper reach of the Canard River. Waste loadings have been estimated at 4,000 pounds BOD₅ per day and 2,500 pounds suspended solids per day.

The plant was constructed and placed in operation in 1959. Although only partial treatment of wastes was provided during the first season's operation, the OWRC was assured that satisfactory disposal of the wastes would be provided for the 1960 season. To 1967, no appreciable progress had been made to provide a satisfactory means of disposal or treatment of wastes.

Because of this lack of cooperation the OWRC instituted legal actions and the Company was fined \$100.00 in April of 1967 for contravening Section 27(1) of the Ontario Water Resources Commission Act. The plant was revisited again in May and as no improvement in the waste quality was noted, the Company was charged again and fined a total sum of \$1,000.00 for three separate violations.

In 1968 an Application for Approval was received by the OWRC and the Company subsequently constructed a new spray irrigation system. These facilities, however, have as yet not solved the waste disposal problem completely, as operational difficulties were encountered during the latter part of the operating season.

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CANADIAN CANNERS LIMITED

The Canadian Cannery complex operates 10 different plants throughout the Province of Ontario. Although most of the plants have satisfactory means of waste disposal, a number of the canneries contribute significantly to the pollution of natural watercourses. The Company is carrying out studies and experiments to find an effective means of waste disposal. These studies, however, should be accelerated if the pollution problem is to be solved in the near future.

1) Canadian Cannery Limited - Dresden Plant

The cannery at Dresden processes asparagus, beets, tomatoes, pumpkins, etc., and operates from May through to October with a waste discharge of 100 million gallons over the entire season. Process wastes are screened and spray irrigated over approximately 80 acres of land. Cooling waters are segregated and discharged directly to the Sydenham River.

As there is insufficient land available, 20 acres of the total sprayed area is under-drained to handle this excessive volume and it is this under-drainage that is discharged to the Sydenham River. Waste loadings are estimated at 300 pounds BOD₅ and 100 pounds suspended solids per day. This situation has been further aggravated as some of the land was expropriated for a new school. The industry has been requested to provide an alternate and more effective means of disposal either through a joint scheme with the municipality, or through the installation of private treatment works.

2) Canadian Cannery - Exeter Plant

The Canadian Cannery plant at Exeter employs 370 people and operates from June through to November processing such products as peas, corn and carrots. The total waste discharge approaches 65 million gallons over the entire operating season. The process wastes are spray irrigated and cooling water is segregated and discharged directly to the Ausable River.

Insufficient land is available for the proper disposal of wastes by spray irrigation and consequently there is a substantial overflow to the watercourse. Samples of this drainage have indicated BOD₅ and suspended solid concentrations as high as 550 parts per million and 70 parts per million respectively. Waste loadings were estimated at 400 pounds of BOD₅ and 50 pounds of suspended solids discharged per day to the Ausable River.

The Company has recently submitted an Application for Approval to the OWRC to cover the installation of a new treatment system. It has been proposed to spray the wastes on a new under-drained and properly graded parcel of land, and collect the runoff for further polishing prior to discharge to a watercourse.

3) Boese Food Plant - St. Catharines

Boese Food Limited, a Canadian Cannery plant located in St. Catharines employs up to 300 people and operates from June through to October processing strawberries, cherries, peaches, pears, etc. Waste loadings discharged to Martindale Pond (Twelve Mile Creek) have been estimated at 7,600 pounds per day BOD₅ and 1,400 pounds per day suspended solids.

The waste disposal practices of this plant have been a source of a number of pollution complaints from as early as 1957. Since that time, matters have steadily deteriorated to the point where the OWRC had to institute legal actions in early 1967. The Company was subsequently fined \$100.00 for polluting the watercourse.

As a temporary measure the Company was to continue to discharge the process wastes through the effluent structure of the St. Catharines municipal sewage treatment plant. Research and pilot plant studies were to continue aimed at providing an adequate and effective waste control system for the 1969 canning season. Present indications are that the Company will pretreat the wastes and discharge the effluent to the municipal sewage treatment plant.

CULVERHOUSE CANNING LIMITED - VINELAND

Culverhouse Canning Limited operates a cannery in Vineland on the shores of Lake Ontario during the summer, processing such items as carrots, potatoes, peaches and pears. Untreated process wastes have been discharged to the lake over a number of years with very little effort to improve their quality. Waste loadings have been estimated at 1,200 pounds BOD₅ per day and 150 pounds suspended solids per day.

In 1967 legal action was taken by the OWRC and the Company was fined \$800 for contravening Section No. 27(1) of the Ontario Water Resources Act. The industry has subsequently constructed an extended outfall into Lake Ontario as an interim measure.

ST. JACOBS CANNING COMPANY LIMITED - ST. JACOBS

St. Jacobs Canning Company Limited in St. Jacobs processes apples with operations extending mainly from September through to November and on a smaller scale from November to April. Process wastes amounting to a maximum of 20,000 gallons per day are discharged to the Conestoga River. Waste loadings have been estimated at 600 pounds per day BOD₅ and 200 pounds per day suspended solids. The Company will attempt to reduce the above loading through further in-plant control measures to render the final effluent suitable for discharge to a sanitary sewer when these facilities become available.

E. D. SMITH AND SONS LIMITED - WINONA

E. D. Smith and Sons Limited operates a cannery in Winona with the main operations running from June through to October processing such items as cherries, apples and tomatoes over the entire canning season. To treat the wastes the Company has constructed a complete waste treatment system at a cost approaching \$400,000.00.

Process wastes, ranging in volumes of 150,000 gallons per day, pass through a Sweco screen and are then directed to an aerated lagoon. The lagoon is in two sections and is some 400 feet long having a total capacity of 4.5 million gallons. A network of 104 air guns supplies air to the wastes that are eventually discharged over a "V" notch weir to Lake Ontario. Treatment efficiencies have been estimated at 85% BOD₅ removal.

Even with this high degree of treatment the final effluent still does not meet the OWRC objectives for discharge to a natural watercourse. Depending upon the type of product canned, the concentrations of BOD₅ and suspended solids have ranged from 140 to 230 parts per million, and 60 to 70 parts per million respectively. Waste loadings discharged to Lake Ontario have been calculated at 300 pounds per day BOD₅ and 100 pounds per day suspended solids.

This treatment system was installed in 1967 and, therefore, a number of operational difficulties were encountered. The quality of the effluent has improved during the 1968 canning season and further improvements are expected for next year's operations.

APPLE PRODUCTS LIMITED

Apple Products Limited processes apple pie filling for the food process industry. Spent water originates from the can cooling and the washing operations, as well as unavoidable spillages.

The uncontaminated cooling water amounting to 6,000 gallons per day is discharged to the Credit River. The process waste volume is 3,000 gallons per day with a waste loading of 150 pounds of BOD₅ per day and a negligible amount of suspended solids. These process wastes are directed to a 7,000 gallon tank, the effluent from which is discharged to the Credit River.

The Company has no alternative but to dispose the wastes to a municipal scheme. The wastes could be hauled to the Georgetown system providing an agreement can be reached between both parties. The Georgetown sanitary sewer, at the closest point is 6/10 mile from the Apple Products plant and this suggests the possibility of a sewer connection in the future.

METCALFE FOODS LIMITED - DESORONTO

Metcalfe Foods Limited, in Desoronto, is a canning factory engaged in the canning and freezing of vegetable products and the reconstitution of fruit juices. Uncontaminated cooling waters are discharged directly to the Bay of Quinte. Process wastes amounting up to 92,000 gallons per day are pumped to a vibrating screen and are also discharged to the Bay. Maximum daily waste loadings have been estimated at 4,500 pounds per day BOD₅ and 1,700 pounds per day suspended solids.

Currently a proposal is in the planning stage for the construction of a water pollution control plant to serve the Town of Desoronto. The possibility of accommodating the process wastes from this industry is presently under active consideration by both the municipality and industry. The major waste producing operations at this plant will be discontinued and the remaining process wastes are expected to be discharged to the S.T.P.

STOKELY VAN-CAMP OF CANADA LIMITED - TRENTON

Stokely Van-Camp of Canada Limited operates a canning plant located in the Town of Trenton. Products canned are peas and corn.

Contaminated canning wastes are passed through a vibrating screen prior to discharging to the Bay of Quinte. The estimated BOD₅ loading going to the Bay from the pea and corn operations was 1,430 pounds per day and 6,000 pounds per day, respectively.

At present, the Company is negotiating with the Town of Trenton for permission to discharge the wastes to the municipal sanitary sewer. An increase in the capacity of the existing municipal treatment plant would be required, if it were to accommodate the canning wastes.

WAUPOOS CANNING COMPANY LIMITED - TOWNSHIP OF NORTH MARYSBURGH

Waupoos Canning Company Limited, located in the Township of North Marysburgh, is involved in the canning of tomatoes, peas and snap beans.

Waste treatment facilities consist of a lagoon which serves as a solids collecting basin. Effluent from the lagoon was gaining access to Lake Ontario. Estimated waste loadings entering the lake were 120 pounds per day BOD₅ and 200 pounds per day suspended solids.

The Company should consider the feasibility of land disposal as an ultimate solution.

HYATT CANNING COMPANY LIMITED - TOWNSHIP OF ATHOL

Hyatt Canning Company Limited, located in the Township of Athol is engaged in the canning of peas, tomatoes, and pumpkins. Waste treatment facilities consist of a two-cell lagoon with an overflow to Spence Lake. As the lagooning system only acts as a coarse solids retention basin, the wastes are unsuitable for discharge to the watercourse. Waste loadings have been estimated at 3,650 pounds per day BOD₅ and 3,240 pounds per day suspended solids.

In a report to the industry it was recommended that the discharge of process wastes to Spence Lake be discontinued. It was suggested that consideration be given to the use of land disposal such as spray irrigation, and enlargement of the lagoon to act as a total retention basin. The Company agreed to submit an Application for Approval to the OWRC by the end of 1968 to cover the installation of appropriate treatment works prior to the 1969 canning season.

GRAND VALLEY CANNERS LIMITED - DUNVILLE

This industry is located in the Town of Dunville and processes pickles, tomatoes, beets, and onions. All wastes, including uncontaminated cooling water, are discharged to the municipal sanitary sewer.

At the present time, no effort is made to decrease losses to the sewer through in-plant control. In fact, all solid wastes are passed through a hammer mill before discharge so as not to block the sewers. All the wastes eventually enter the Grand River.

The highest waste loading results from the processing of tomatoes. A daily flow of 160,000 gallons and a loading of 2,500 pounds of BOD₅ and 1,250 pounds of suspended solids has been estimated for the tomato pack.

Construction of the municipal pollution control plant for the Town of Dunville is expected to be completed within two years. This industry is expected to screen the process wastes and discharge the effluent to a sanitary sewer. Clean cooling water is to be segregated and discharged to the watercourse.

MATTHEWS-WELLS COMPANY LIMITED - GUELPH

This plant is located in the City of Guelph and produces pickles, jams, jellies and marmalades. All wastes from inside the plant, both sanitary and industrial, are discharged to the municipal sanitary sewers. Those wastes originating outside the plant, namely waste brine from the pickle vats, are discharged to a series of ditches that eventually discharge to the Eramosa River.

There are 650 pickle vats. Each of these is drained once per year, which results in a discharge of waste brine solution (1,500 gallons) and a rinse of approximately twice the volume. All rinsing is done just prior to filling the vats with cucumbers in August and September. The brine is discharged throughout the year. Analysis of the brine solution is as follows:

BOD ₅	-	9,800 parts per million
Suspended Solids	-	1,200 parts per million
Chlorides	-	49,000 parts per million
pH	-	3.4

This gives rise to daily loadings of about 300 pounds of BOD₅, 40 pounds of suspended solids and 3,000 pounds of sodium chloride.

Discussions with the industry have been initiated with the aim of having these wastes collected and discharged to the municipal sanitary sewers.

GEORGIAN BAY FRUIT GROWERS LIMITED - THORNBURY

This Company is situated in the Town of Thornbury and processes apples into apple sauce and apple juice. After screening, all wastes are discharged to the municipal sewer which empties into Nottawasaga Bay.

During the processing season, the waste flow is in the order of 100,000 gallons per day. The waste has a BOD₅ of 2,700 to 6,300 parts per million and suspended solids of 7,000 to 10,000 parts per million. The pH varies from 4.0 to 5.6. This gives loadings in the order of 4,500 pounds of BOD₅ and 8,500 pounds of suspended solids per day.

Pilot plant work has been done on the treatability of these wastes in conjunction with the town sanitary wastes. Results of these studies showed that treatment is possible. The plant wastes are to be accepted into the proposed sewage treatment plant that is to be completed by 1971.

TABLE NO. VI

A SUMMARY OF THE CANNING INDUSTRIES HAVING UNSATISFACTORYWASTE DISCHARGES TO NATURAL WATERCOURSES

NAME	POINT OF DISCHARGE	PROCESS WASTE	WASTE LOADINGS		REMARKS
		VOLUME (l/gal) MAXIMUM	BOD ₅ (lbs/day) MAXIMUM	SUSP. SOLIDS (lbs/day) MAXIMUM	
H. J. Heinz Company of Canada Limited Leamington	Lake Erie	3,000,000	17,500	8,600	Wastes are screened and discharged via an extended outfall.
Libby McNeill and Libby, Wallaceburg	Sydenham River	430,000	11,000	2,700	Waste screened prior to discharge.
Essex County Cannery Gosfield North	Cannard River	35,000	4,000	2,500	Coarse solids removal.
Canadian Cannery Limited, Exeter	Ausable River	75,000	400	50	Runoff from sprayed area flowing into watercourse.
Canadian Cannery Ltd., St. Catharines	Martindale Pond (Twelve Mile Creek)	250,000	7,600	1,400	Waste screened
Culverhouse Canning Ltd., Louth Twp.	Lake Ontario	100,000	1,200	150	Consultant retained to design waste treatment.
St. Jacobs Canning Co. Ltd., St. Jacobs	Conestoga River	20,000	600	200	Coarse solids removal.
E. D. Smith and Sons Limited, Winona	Lake Ontario	125,000	300	100	Wastes screened and treated in aerated lagoon.

Table No. VI Continued

NAME	POINT OF DISCHARGE	PROCESS WASTE VOLUME (lgpd) MAXIMUM	WASTE LOADING		REMARKS
			BOD ₅ (lbs/day) MAXIMUM	SUSP. SOLIDS (lbs/day) MAXIMUM	
Canadian Cannery Limited, Dresden	Sydenham River	200,000	300	100	Under-drainage from 20 acres discharged to watercourse.
Apple Products Ltd. Glen Williams	Credit River	3,000	150	--	Wastes may be trucked to municipal S.T.P.
Metcalf Foods Ltd. Deseronto	Bay of Quinte	92,000	4,500	1,700	Negotiation under way to accept wastes in S.T.P.
Stokely Van Camp of Canada Ltd., Trenton	Bay of Quinte	300,000	6,100	2,400	Negotiation under way to accept wastes in S.T.P.
Waupoos Canning Co. Ltd., North Marysburg	Lake Ontario	162,000	120	200	Lagoon acts to remove coarse solids.
Hyatt Canning Co. Ltd. Athol Township	Spence Lake	25,000	1,220	4,030	Lagoon acts to remove solids only.
Grand Valley Cannery Limited, Dunnville	Grand River	160,000	2,500	1,250	Will attempt to discharge to S.T.P.
Matthew-Wells Co. Ltd. Guelph	Eramosa River	3,000	300	40	Pickle vats emptied to watercourse. Will attempt to discharge wastes to S.T.P.

Table No. VI Continued

NAME	POINT OF DISCHARGE	PROCESS WASTE VOLUME (lgpd) MAXIMUM	WASTE LOADINGS		REMARKS
			BOD ₅ (lbs/day) MAXIMUM	SUSP. SOLIDS (lbs/day) MAXIMUM	
Georgian Bay Fruit Growers Limited Thornbury	Nottawasaga	100,000	4,500	8,500	Negotiations under way to discharge wastes to S.T.P.

GENERAL DISCUSSION OF WASTE DISPOSAL IN THE CANNING INDUSTRY

There are approximately 175 establishments in Ontario registered with the Fruit and Vegetable Division (Processing), Production and Marketing Branch, Department of Agriculture in Ottawa. This report deals with some ninety industries which process fresh fruits and vegetables into a canned commodity. The plants that produce dehydrated fruits and powders, jams, pie fillings, etc., are not considered as they do not fall within the scope of this report.

During peak operations, the active canneries in Ontario represent a total labour force of about 60,000 people. In general, canning is a seasonal operation lasting for approximately six months from early May through to the first frost. The processes vary continuously and widely, fluctuating with the type of produce, market demands, weather conditions, size of crop, etc.

From a waste point of view the canneries present a unique problem because they discharge large volumes of strong wastes only during the summer months. The volume and nature of the waste varies considerably with each pack and, therefore, the treatment facilities usually have to be very flexible in order to provide complete treatment. Because the canneries are producers of food for human consumption, they are subject to strict requirements under the health legislation. As cleanliness is one of the main requirements, this necessitates the heavy use of water to keep all utensils, machines, tools, and products clean. Hence, a high volume waste discharge is the prime characteristic common to the industry.

Process wastes from the canning industry should not be discharged to a watercourse without treatment as this effluent normally contains high concentrations of suspended solids, as well as soluble organics that can exert a high BOD₅. These wastes are discharged in the summer during the tourist season when waters are used extensively for recreational purposes. Because of their conspicuous nature, these wastes are easily detected and can become a public nuisance.

The wastes from the canning industry, while high in soluble organic content, do not pose a hazard to public health. The organic nature of the wastes is of prime importance when it is considered that during warmer weather the dissolved oxygen content in a natural body of water is relatively low and the rate of decomposition is appreciably higher. The effects of organic wastes on a watercourse become more severe at this time of the year and, therefore, treatment of the wastes prior to discharge becomes an absolute necessity.

In general, the industry has faced up to the problem of waste disposal and has taken notable precautions to prevent the pollution of natural bodies of water. Of the ninety-one industries mentioned in this report, seventy-one may be considered as having adequate waste control programmes. In many cases the treatment facilities were put in just recently and as the plant personnel become familiar with their operations, better treatment can be expected in the future.

Under the existing Provincial Project Scheme, a number of water pollution control plants are to be constructed in the rural communities. Many of the canneries in these areas will be discharging their wastes to the

sanitary sewers for treatment at these plants once the new treatment facilities become available. Completion of these projects will eliminate a number of existing problems.

The remaining industries that do not have an acceptable means of waste disposal should provide proper treatment of wastes to prevent the pollution of natural watercourses. Such treatment must be adequate to protect and upgrade water quality in the face of population and industrial expansion. The oxygen content of the receiving water should be one of the bases in determining the adequacy of the pollution control measures in conjunction with the factors outlined in the Ontario Water Resources Commission's objectives for "Industrial Waste Control in Ontario". However, before even considering the principle of dilution and assimilating capacity of the receiving water, the industry should provide the best practical treatment facilities that present technology will allow.

Under the terms of the OWRC Act, the Commission is in a position to provide funds for the construction of treatment facilities for specific industries, however, because of the complicated financial agreements that would have to be drawn up, as yet no attempts have been made in that direction. The Commission has provided funds for the construction of separate municipal and industrial waste treatment facilities, however, in these cases it was the municipality that assumed the responsibility for the industrial waste facilities and the agreement covering such a project was between the municipality and OWRC. The municipality then made separate agreements with the industry to recover costs for the industrial waste works.

A number of canneries in the Province of Ontario have indicated

marginal profits claiming that only partial treatment of wastes could be provided. It is certainly recognized that the treatment of wastes is a costly proposition, however, in this present society treatment should be considered simply as one of the costs of doing business. If the canneries with marginal profits cannot meet the demands of competition as well as the other established plants in the Province that do have adequate means of waste disposal, then it may be necessary for those companies to cease operations.

The Ontario Water Resources Commission was vested with the responsibility of protecting the natural water resources in the Province of Ontario. In carrying out this duty, the Commission found it necessary to prosecute three canneries for contravening Section No. 27(1) of the OWRC Act. These prosecutions were certainly justified as the industries in question were requested on numerous occasions to provide an adequate means of waste disposal to eliminate the discharge of contaminated wastes and prevent the pollution of the receiving waters. As no satisfactory attempts were made to comply with any of the requests, there was no other recourse but to institute legal actions. The prosecutions were effective and served their purpose as the industries were then committed to embark on a more active waste control and/or treatment programme.

Two canneries, Belle River Canning Company Limited, and E. D. Smith Company Limited, have constructed biological oxidation facilities and have operated them at treatment efficiencies in the 85 to 90 percent range. Cannery process wastes are extremely potent at the start and, therefore, even with this high degree of treatment the final effluent discharge to the watercourse still does not meet the OWRC objectives in terms of the BOD₅ and suspended solids

concentrations. In these and in similar cases where the industry has made notable attempts to treat the process wastes, effluent quality objectives should be determined based on the assimilating capacity of the receiving water. However, if the receiving water cannot absorb waste of this quality, then the industry should provide additional treatment to protect the receiving watercourse.

Up to this point in the discussions, the only waste constituents that were considered were suspended solids, and materials that exerted a high BOD₅. It should be noted that some cannery wastes are rich in nutrients containing high concentrations of nitrates and phosphates. These chemicals have definite detrimental effects on a receiving watercourse as they encourage the growth of algae and other unsightly vegetation. These parameters have never been considered in the past, however, they are presently being studied by the OWRC and it is expected that waste quality objectives along this line will be made public in the near future. Industries that discharge wastes rich in nutrients, will more than likely be required to provide tertiary treatment.

As mentioned previously, the wastes from this particular industry fluctuate considerably from pack to pack and in some cases even from day to day when the same product is being processed. The farming aspects have become very scientific in the last decade. Planting is planned to have all the produce ripen within a few days of a pre-arranged time to correspond to the predicted market demands and the scheduling of the cannery operations. Consequently, as all the produce is ready for harvesting, more or less at the same time, the cannery must work on a continuous basis to handle the

incoming load. Of necessity the operations are hurried and at times tend to become sloppy from the waste control point of view. On top of this, many of the workers on the lines are piece-work employees and consequently it is very difficult to apply good in-plant control.

Because of the nature of the industry, it is difficult to provide an accurate relationship between the rate of production and the waste loadings discharged. If the product is cut or broken during the processing and the internal contents are transferred to the wash water, the plant effluent is usually very potent containing high concentrations of soluble organics that exert a high BOD₅. On the other hand, if the product is simply washed, wastes of relatively low BOD₅ are involved.

In general the wastes may be divided into three broad categories. Pea and wax-bean processing wastes are high in volume but relatively low in suspended solid concentrations and exhibit a low BOD₅; peach, carrot, tomato, strawberry, and cherry processing wastes are of intermediate strength and volume; and finally corn and pumpkin processing wastes are low in volume, but very potent containing high concentrations of suspended solids and exhibiting an extremely high BOD₅. The approximate relationship of the production rate to the expected strength and volume of wastes discharged is presented in Table No. VII. These figures are based on information obtained during surveys of various canneries throughout the Province carried out by the field staff of the OWRC.

TABLE NO. VII

WASTE LOADING - PRODUCTION RELATIONSHIP PER COMMON

CASE OF PRODUCE

PRODUCE	PROCESS WASTES (I. Gallons)	BOD ₅ (ppm)	(lbs/case)	SUSPENDED SOLIDS (ppm)	(lbs/case)
Peas, beans	60 to 70	300 to 1000	.2 to .6	170 to 400	.1 to .3
Carrot					
Tomato					
Pears					
Peaches	50 to 60	1700 to 2300	.8 to 1.4	800 to 1500	.4 to .9
Potatoes					
Strawberries					
Corn, pumpkins	40 to 50	3500 to 4200	1.4 to 2.1	1800 to 2800	.7 to 1.4

* A case containing 24 cans of a size in which the produce is most commonly canned.

CONCLUSIONS AND RECOMMENDATIONS

Generally speaking the canning industry has faced up to the problem of waste disposal in a satisfactory manner. The overall picture is encouraging and shows promise for the future when it is considered that a number of plants are actively engaged in the construction of proper treatment works. Water pollution control plants are being planned for some of the rural communities and, as these will be accepting cannery wastes, a number of existing problems will be eliminated. This report mentions over ninety canneries of which approximately seventy may be considered as having suitable means of waste disposal.

The methods of treatment (satisfactory or otherwise) used by this industry are varied and may be broken down as follows:

Land Disposal (Spray irrigation and haulage on land)	- 30
Discharge to Sanitary Sewer	- 26
Lagoons (Total retention, etc.)	- 21
Mechanically Aerated Biological Oxidation Systems	- 4

There are still some seventeen canneries in the Province that discharge wastes of an unacceptable quality to natural bodies of water. These industries may have some form of treatment, however these facilities are minimal and have proven to be ineffective. The top three polluters in the Province, based on loadings discharged to a receiving stream, waste volume, etc., and in order of magnitude, are listed as follows:

1) H. J. Heinz Company of Canada Limited	- Leamington
2) Libby McNeill and Libby of Canada Limited	- Wallaceburg
3) Stokely Van Camp of Canada Limited	- Trenton

In cases where plants have unacceptable waste discharges, it is recommended that the OWRC take strong actions to have these Companies institute concrete waste control and/or treatment programmes. Meetings should be arranged between representatives from the Companies and the OWRC to set up a tight schedule for the construction of appropriate treatment works. If the agreed construction schedules are not adhered to, the OWRC should not hesitate to take necessary actions under the terms of the Ontario Water Resources Commission Act.

There were three canneries taken to court and successfully prosecuted under Section 27 of the Ontario Water Resources Commission Act. As a result of these legal actions, the industries provided better control over the waste discharges and improved the quality of the final effluents disposed to a natural watercourse. The OWRC should maintain a strict surveillance of these plants to insure proper and continuous treatment of wastes.

There are a number of industries in the Province that have constructed proper and technically sound treatment works. Even though these facilities are operated satisfactorily, the final effluent still fails to meet the OWRC objectives for discharge to a natural watercourse. Recently the new policy of the OWRC has been to consider the assimilation of organic wastes as a legitimate use of a watercourse. The type of discharges mentioned above, after proper treatment might be considered as a satisfactory means of waste disposal providing the quality of the receiving water was not adversely affected and would meet requirements for such uses as sources of domestic water supply, navigation, fish and wild life, bathing, recreation, agriculture and other riparian activities.

Even though an industry has provided acceptable waste treatment facilities, inspection of the plants should not be discontinued. At least one visit per year is recommended to insure that all equipment is being properly operated. If there are any difficulties, recommendations by field men on the spot may suffice to restore proper operations.

In conclusion, this is a status report that deals with the waste disposal practices of the canning industry in general. In some cases the comments may not apply to a particular plant because many canneries have their own peculiar processes and their own particular waste disposal problem. In dealing with this industry the OWRC should, therefore, consider each plant separately and have waste disposal requirements tailored to the individual needs of each plant. The canneries on the other hand should co-operate with the OWRC and embark on effective waste control and/or treatment programmes to protect the natural water resources of the Province of Ontario.



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